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# M.A.C.E. JOURNAL

*"Devoted Exclusively To The Atari Computer User"*

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TYPER

### JIM'S HANGMAN

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!< ^ . ^ >

!

SCORE

YOU 1

ME 1

LETTERS

REMAINING

BCD FGH

JKLMN PQR

T VWXYZ

— U — U — I O U S

GUESS A LETTER

Published by the Michigan Atari Computer Enthusiasts

## THE FIRESIDE CHAT

with Kirk Revitzer

Well would ya look at this!! I guess right now you're thinking, "Gee, look what they've gone and done to the Journal." Well, it was nice to have the only glossy Atari newsletter (that we were aware of) in the USA. But then, on the other hand, this new format will save the club a lot of money. While we are not ready for the welfare rolls, we aren't rich either. So we all sat around at the officers' meeting and asked, "What should our newsletter be?" We all came up with the same basic idea: it should be educational, informative and entertaining. So we all said, "Hey, those are good ideas" and here it is, the final product. So before you judge a book by its inside cover, read on. I really do hope you enjoy it. And look at it this way, as far as not being glossy: at least the light won't glare in your eyes.

Now that we've covered the book (I really didn't plan that), let's talk about the meetings. Same old stuff you say? Well, not quite. Before I start, though, watch for a subject that you're good in, because of course, we need volunteers! Now, read carefully and see where YOU fit in.

We are not going to close the tables during the meeting. In fact, we are going to have more. Let's see, what would make a good 'user' group? Well, there's the disk & tape library. And how about a table that offers all kinds of information on hardware modifications and stuff? Or how about one with all those guys who are really good programmers and can help us get past that one tiny bug? Sounds good, eh? Now all we need is for some of you nice people to walk right up to the front, right here at this very meeting, and say, "Gee wiz, I'd sure like to help!"

Well, now I'll go and start getting ready for next month's article. I have never ever done anything like this before so if it looks funny, oh well...

P.S. I will try to answer any and all of your questions the best I can. Feel free, at any time, to leave any suggestion or question via

MACE MAIN & MACE WEST BBS, the MACE hotline or my own BBS. The numbers are elsewhere in this journal.

'Till next month,

Kirk

## SHOW AND TELL

(This space is reserved for all those quirky little items that don't fit in anywhere else. Any contributions will be welcomed.)

AtariArtist fans - Place the cursor over the Atari logo in the upper left hand corner of the menu and push one of the buttons on the Touch Tablet. Isn't that interesting?

And speaking of AtariArtist, there is an undocumented trick for saving files in uncompressed form. Pressing the Insert key will save your picture with the file name "PICTURE". You can then use DOS to rename that file so that you can save another picture in the same way. (If you don't rename the file, the second picture saved will write over the first file.)

Remember Caverns of Mars? Did you know that you can skip to a higher level by holding down the Shift and Control keys at the same time?

If you want to toggle the value of a variable between zero and one within a loop, you can use this BASIC statement:

```
X=(X=0)
```

Why is that, you ask? This statement sets X equal to the value of the expression X=0. When X equals one, the expression is false, which gives it a value of zero, so X becomes zero. When X equals zero, the expression is true, so X becomes one. Thank you, Mr. Boole.

That's all for this month. Send in your favorite tricks and secrets.



## THE SHELL GAME

### CRACKING ATARI LOGO

by Ann McBain Ezzell

Seymour Papert certainly knew what he was doing when he chose a turtle to represent the cursor in Logo. The inner workings of the Atari version sit safely nestled inside the convenient ROM cartridge, virtually inaccessible to the casual user. The language itself is powerful, both in its implementation of turtle graphics and list processing capabilities, but what about those of us who like to throw in the occasional display list interrupt or machine language routine? The manuals and reference guide which come with the Logo cartridge are fine as far as they go, but they leave you firmly outside the turtle's shell. I have done some exploring inside the shell, and I plan to do more. In this column, I will try to share with you what I have found, and I hope that other turtle dissectors will write in and do the same.

Atari Logo has some special primitives, prefixed with a period to warn you that you have to be careful when using them. `.CALL` followed by an address will transfer control to a machine language routine residing at that address. (Of course, you must end the routine with a Return To Subroutine, or it's bye-bye turtle.) `.EXAMINE` and `.DEPOSIT` are equivalent to the BASIC `PEEK` and `POKE` commands, allowing you to look at the contents of an address or change the contents of a specified address.

That's fine. Now, how can we use these primitives? Before we can store a machine language routine, we need to have a safe location in memory that we know will not be overwritten by the Logo cartridge. And before we can `.EXAMINE` or `.DEPOSIT`, we need to know what locations are used for what purposes. If you are familiar with Atari BASIC and the locations used for color registers, RAM top, etc., you will find that many of the addresses used by Atari Logo are the same, but some are different. Sounds like we need a memory map, doesn't it?

The best sourcebook which I have found for

exploring the innards of the Atari is Ian Chadwick's Mapping the Atari, published by COMPUTE! Books. My copy is never far from me when I program, and I strongly recommend that any of you who have not yet done so rush right out and buy a copy of your own. I'll wait.

Okay, let's assume that you have some sort of memory map for your Atari. You still need to know about certain specific locations used by Atari Logo, which does not manage its memory in the same way that BASIC does. I obtained from Logo Computer Systems, Inc. (the friendly people who brought you Atari Logo) and also from Atari Customer Support, four pages of information entitled "ATARI LOGO Useful Addresses." No author was credited, so, whoever you are, thank you. Here are some of the addresses listed (in decimal notation), plus brief explanations.

- 159 Pointer to first node of User Symbol List  
(linked list of 5-byte nodes)
- 1536 Line Edit Buffer (112 bytes)
- 1648 Line Edit Kill Buffer (112 bytes)
- 12544 System Symbol List Start  
(linear list of 5-byte nodes)
- 13824 Shape table (256 bytes)
- 14080 Display List Start
- 14268 High byte of Nodespace Start
- 14269 High byte of Nodespace Rest
- 14270 High byte of Nodespace End
- 14271 High byte of Nodespace Hole
- 14272 Pointer to Edit Buffer and Screen  
Buffer Start
- 14288 Demon Table (48 bytes)
- 14400 Text Buffer Start
- 15360 Player Buffer (1024 bytes)
- 16384 Screen Buffer Start and Edit Buffer  
Start on 64K configuration

20223 Screen Buffer End and Edit Buffer End  
on 64K configuraton

39929 Program Halt

50048 Warm Boot

53256 Setsize (4 bytes)

#### Notes on the addresses:

Pointer: A pointer consists of a consecutive pair of bytes which make up a 16-bit address; thus, it "points" to a given location in memory. The address is in Low-High order: to find the value of the indicated address, multiply the high byte (second byte) by 256 and add it to the low byte (first byte). For example, to find the location of the first node of the User Symbol List, you would type:

PR 256 \* .EXAMINE 160 + .EXAMINE 159

User Symbol List: Every new word or "symbol" which you teach Logo is stored in this linked list of nodes. A "node" is a unit of five consecutive memory bytes. The first byte (the "type" byte) contains garbage collection flags, as well as information about the kind of object stored in this node. The second and third bytes point to the first node of another linked list: a list containing everything that Logo knows about that particular symbol. The fourth and fifth bytes point to the next node on the User Symbol List. Nodes are thus "linked" together, although each node is located at a random address in the nodespace.

Line Edit Kill Buffer: Any characters killed with the DELETE key will be stored here and can then be retrieved by pressing Control-Y. When you press RETURN, the last line typed is stored in this buffer.

System Symbol List: This is a linear list of physically consecutive nodes. One node is allotted to each Logo primitive. The 6502 code for any primitive begins two bytes beyond the address stored in the fourth and fifth bytes of its SSL node. The ASCII characters in the primitive's "print name" (e.g. FORWARD or RIGHT) are stored backwards, in consecutive bytes, immediately prior to this address.

Shape Table: This area contains 16 blocks, one for each definable turtle shape. Each block consists of 16 consecutive bytes. The information in blocks 1-15 can be altered with EDSH, GETSH and SETSH. Shape 0 is reserved for the normal turtle shape and cannot be altered. The first 16 bytes in the table, corresponding to shape 0, normally contain values of 0.

Display List Start: Atari Logo uses Graphics Mode 7 for its graphics displays. A routine called the "Display List Maker" automatically sets up the appropriate display list for each screen mode (e.g. Fullscreen, Splitscreen, Textscreen). If you want to alter the display list, you must make your changes after you call the display mode which you want to use, or your changes will be overwritten by the Display List Maker. (More on this next month.)

Nodespace: This is the area available for your procedures and variables. It includes space needed during the parsing (tokenizing) and execution of Logo procedures as well as space needed by the Symbol Lists. Atari Logo Nodespace is grouped into two banks. The first bank runs from "Nodespace Start" to "Nodespace Hole" and the second bank from "Nodespace Rest" to "Nodespace End". The values in these locations will depend on whether you are using a 32K or 64K configuration. Note that the four Nodespace bytes contain only the high byte of the addresses; to get the actual addresses, you must multiply the values by 256.

Edit Buffer and Screen Buffer: Atari Logo uses the same 3840-byte block of memory for both the Logo editor and the turtle graphics screen image. You will lose any turtle picture on the screen if you enter the editor. As with the Nodespace locations, the Buffer address differs between a 32K and a 64K configuration.

Demon Table: Each of the 22 WHEN demons is allotted a consecutive pair of bytes in this table. These bytes point to a list of instructions which will be carried out should the corresponding event occur.

Text Buffer: Text displayed on the screen is

stored here. This lets you switch back and forth between Textscreen, Splitscreen and Fullscreen without losing your text.

Player Buffer: Each turtle has a 256-byte block of memory as its player area. This is simply the player area for Player/Missile Graphics.

Program Halt: If you are not at toplevel, you can .CALL this address to stop your program and return you to toplevel. You might find this useful for error handling.

Warm Boot: .CALL this address to restart the Logo cartridge. You will lose everything in your workspace, except for Logo primitives.

Setsize: The four bytes starting at this address control the width of the four turtle shapes (0-3 in order). .DEPOSIT 0 or 2 here for normal width, 1 for double width, or 3 for quadruple width.

Well, that ought to give you lots to think about and play with. Next month, I will suggest some ways to store and call machine language routines, and show you how to use Display List Interrupts from Atari Logo.

## HANGMAN

introduced by Kirk Revitzer

This month's program listing, Hangman, was written by M.A.C.E. member Jim Wilson. It has a 500 word vocabulary as listed which may be changed, added to or subtracted from by the user. Having played this game, I give it a 10+ rating. The graphics are nice and the play is fast and smooth. REM's throughout the program make it very easy for even the novice programmer to follow.

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Starting this month, programs listed in the MACE Journal will also be available for download on the MACE MAIN and MACE WEST bulletin boards.

## HOW MANY PROGRAMMERS...

I'm sure you have all heard some version of the one about "How many whatevers does it take to change a lightbulb?":

How many (insert your least favorite ethnic group) does it take to change a lightbulb? Three... one to hold the bulb and two to turn the ladder.

How many Bloomfield Hills housewives does it take to change a lightbulb? Two... one to make the martinis and one to call the electrician.

How many Californians does it take to change a lightbulb? Five... one to do the job and four to share the experience.

And so on. Now here is your chance for some more of that fame and glory we keep promising. We are looking for the best punchlines for a computer-oriented version of this old standard. It can be about programmers in general, a specific type of programmer, owners of a given computer brand - even a well known figure in the computing world. (Surely someone ought to be able to come up with a good answer to "How many Tramiels does it take...") Send your entries to:

HOW MANY?

c/o MACE

P.O. Box 2785

Southfield, MI 48037

All entries must be postmarked by November 30th. The best entries will be published in the January MACE Journal.



```

100 REM
110 REM          HANGMAN 1.0
120 REM      Written by Jim Wilson
130 REM
140 REM          April 9, 1983
150 REM
160 REM      (C) 1983 Wilson Software
170 REM          Berkley, Mi
180 REM      All rights reserved
190 REM
200 REM      Permission to download
210 REM      from MACE WEST granted
220 REM          AUGUST 21, 1984
240 REM
250 REM
260 REM
270 REM
280 DIM ALPHABET$(26)
290 DIM ANSWER$(10)
300 DIM BODY$(23)
310 DIM CHECK$(10)
320 DIM L$(1)
330 DIM NAME$(10)
340 DIM TYPE$(13)
350 DIM UNUSED$(26)
360 DIM WORD$(10)
370 TYPE$="BY JIM WILSON"
380 GRAPHICS 17
390 POKE 53774,112:POKE 16,112
400 POKE 712,50:POKE 708,58
410 FOR DELAY=1 TO 100:NEXT DELAY
420 X=0:Y=0
430 POSITION X,Y: ? #6;"N":GOSUB
730:POSITION X,Y: ? #6;" "
440 IF Y=10 THEN POSITION X,Y: ?
#6;"N":X=14:Y=0:GOSUB 820:GOTO 460
450 X=X+1:Y=Y+1:GOTO 430
460 POSITION X,Y: ? #6;"H":GOSUB
730:POSITION X,Y: ? #6;" "
470 IF Y=10 THEN POSITION X,Y: ?
#6;"H":X=2:Y=20:GOSUB 820:GOTO 490
480 X=X-1:Y=Y+1:GOTO 460
490 POSITION X,Y: ? #6;"1":GOSUB
730:POSITION X,Y: ? #6;" "
500 IF Y=10 THEN POSITION X,Y: ?
#6;"1":X=18:Y=20:GOSUB 820:GOTO 520
510 X=X+1:Y=Y-1:GOTO 490
520 POSITION X,Y: ? #6;"M":GOSUB
730:POSITION X,Y: ? #6;" "
530 IF Y=10 THEN POSITION X,Y: ?
#6;"M":X=16:Y=20:GOSUB 820:GOTO 550
540 X=X-1:Y=Y-1:GOTO 520
550 POSITION X,Y: ? #6;"N":GOSUB
730:POSITION X,Y: ? #6;" "

```

```

560 IF Y=10 THEN POSITION X,Y: ?
#6;"N":X=15:Y=0:GOSUB 820:GOTO 580
570 X=X-1:Y=Y-1:GOTO 550
580 POSITION X,Y: ? #6;"A":GOSUB
730:POSITION X,Y: ? #6;" "
590 IF Y=10 THEN POSITION X,Y: ?
#6;"A":X=3:Y=20:GOSUB 820:GOTO 610
600 X=X-1:Y=Y+1:GOTO 580
610 POSITION X,Y: ? #6;".":GOSUB
730:POSITION X,Y: ? #6;" "
620 IF Y=10 THEN POSITION X,Y: ?
#6;".":X=0:Y=1:GOSUB 820:GOTO 640
630 X=X+1:Y=Y-1:GOTO 610
640 POSITION X,Y: ? #6;"A":GOSUB
730:POSITION X,Y: ? #6;" "
650 IF Y=10 THEN POSITION X,Y: ?
#6;"A":X=4:Y=20:GOSUB 820:GOTO 670
660 X=X+1:Y=Y+1:GOTO 640
670 POSITION X,Y: ? #6;"5":GOSUB
730:POSITION X,Y: ? #6;" "
680 IF Y=10 THEN POSITION X,Y: ?
#6;"5":X=17:Y=20:GOSUB 820:GOTO 700
690 X=X+1:Y=Y-1:GOTO 670
700 POSITION X,Y: ? #6;"G":GOSUB
730:POSITION X,Y: ? #6;" "
710 IF Y=10 THEN POSITION X,Y: ?
#6;"G":GOSUB 820:GOTO 740
720 X=X-1:Y=Y-1:GOTO 700
730 RETURN
740 X=3:Y=12
750 FOR DELAY=1 TO 50:NEXT DELAY
760 GOSUB 2590
770 FOR I=1 TO LEN(TYPE$)
780 POSITION X,Y: ?
#6;TYPE$(I,I):X=X+1
790 IF TYPE$(I,I)=" " THEN GOSUB
840:NEXT I
800 GOSUB 830:NEXT I
810 GOTO 850
820 FOR V=14 TO 0 STEP -0.5:SOUND
0,13,4,V:NEXT V:RETURN
830 FOR V=14 TO 0 STEP -1:SOUND
0,13,4,V:NEXT V:RETURN
840 FOR DELAY=1 TO 14:NEXT
DELAY:RETURN
850 GRAPHICS 1:POKE 710,50:POKE
712,50:POKE 708,58:YOU=0:ME=0
860 POKE 16,112:POKE 53774,112
870 POSITION 4,10: ? #6;"HANGMAN
1.5":POSITION 3,12: ? #6;"BY JIM
WILSON"
880 Z=INT(32*RND(0)+1):RESTORE
2250+Z*10:X=INT(50*RND(0)+1)
890 ? " ENTER YOUR FIRST NAME "

```

```

900 INPUT NAME$
910 POKE 709,2
920 FOR I=1 TO X
930 READ WORD$
940 A=1
950 IF WORD$="1E97" THEN RESTORE
2250:X=INT(50*RND(0)+1):GOTO 920
960 NEXT I
970 GOTO 1050
980 FOR I=1 TO X
990 READ WORD$
1000 IF WORD$="1E97" THEN RESTORE
2250:X=INT(50*RND(0)+1):GOTO 980
1010 NEXT I
1020 ALPHABET$=""
1030 A=1
1040 IF WORD$="1E97" THEN RESTORE
2250:X=INT(50*RND(0)+1):GOTO 980
1050 GRAPHICS 1
1060 POKE 16,112:POKE 53774,112
1070 REM
  INITIALIZE REMAINING LETTERS
  STRING
1080
UNUSED$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
1090 POKE 708,154:POKE 710,144:POKE
712,144
1100 POSITION 1,0: ? #6;NAME$;"'S
HANGMAN"
1110 POSITION 0,1: ?
#6;"_____ "
1115 POSITION 13,2:PRINT #6;"SCORE"
1118 POSITION 13,4: ? #6;"YOU
";YOU:POSITION 14,5: ? #6;"ME ";ME
1120 POSITION 1,3: ? #6;"*****"
1130 POSITION 1,4: ? #6;"*      !"
1140 FOR I=5 TO 14
1150 POSITION 1,1: ? #6;"*"
1160 NEXT I
1170 POSITION 0,15: ? #6;"***"
1180 POSITION 0,16: ? #6;"***"
1190 POSITION 12,9: ? #6;"LETTERS"
1200 POSITION 11,10: ? #6;"REMAINING"
1210 POSITION 11,11: ? #6;"-----"
1220 POSITION 11,12: ?
#6;"ABCDEFGH":POSITION 11,13: ?
#6;"JKLMNOPQ":POSITION 11,14: ?
#6;"STUVWXYZ"
1230 REM  PRINT BLANK SPACES
1240 POSITION 0,18:FOR I=1 TO
LEN(WORD$): ? #6;"_ ";:NEXT I
1250 REM
  INITIALIZE CHECK WORD LENGTH
1260 FOR I=1 TO

```

```

LEN(WORD$):CHECK$(I,I)="*":NEXT
I:ANSWER$=WORD$
1270 C=0
1280 POKE 752,1: ? : ? : ?
" GUESS A LETTER "
1290 POKE 709,10:POKE 752,1:CLOSE #1
1300 POKE 764,255
1310 OPEN #1,4,0,"K:"
1320 GET #1,L
1330 POKE 709,1
1340 GOSUB 2210
1350 IF NOT (OK) THEN 1290
1360 L$=CHR$(L)
1370 IF L$="" THEN 1290
1380 REM
  REMOVE INPUT LETTER FROM REMAINING
  LETTER STRING
1390 FOR I=1 TO LEN(UNUSED$)
1400 IF UNUSED$(I,I)=L$ THEN
UNUSED$(I,I)=" ":GOTO 1420
1410 NEXT I
1420 REM
  REMOVE INPUT LETTER FROM SCREEN
1430 D=11:E=12
1440 FOR I=1 TO LEN(UNUSED$)
1450 POSITION D,E: ?
#6;UNUSED$(I,I):D=D+1
1460 IF D=20 THEN D=11:E=E+1
1470 NEXT I
1480 REM
  REMOVE INPUT LETTER FROM INPUT REJE
  CT STRING
1490 FOR M=1 TO LEN(ALPHABET$)
1500 IF ALPHABET$="" THEN 1530
1510 IF ALPHABET$(M,M)=L$ THEN ?
CHR$(125):GOTO 1290
1520 NEXT M
1530 REM
  CHECK WORD FOR INPUT LETTER
1540 C=C+1
1550 B=0
1560 FOR I=1 TO LEN(WORD$)
1570 IF WORD$(I,I)=L$ THEN B=1:GOTO
1810
1580 NEXT I
1590 IF B=0 THEN 1610
1600 GOTO 1290
1610 REM  HANGMAN CHARACTER
1620 BODY$="/-\\(^.^)\\_/!!!!>---</\\/"
1630 ON A GOTO
1650,1680,1710,1730,1750,1770
1640 REM  HEAD
1650 POSITION 5,5: ?
#6;BODY$(1,3):POSITION 4,6: ?

```

```

#6;BODY$(4,8):POSITION 5,7:?
#6;BODY$(9,11):A=A+1
1660 GOSUB 2160:GOTO 1290
1670 REM BODY
1680 POSITION 6,8:?
#6;BODY$(12,12):POSITION 6,9:?
#6;BODY$(13,13):POSITION 6,10:?
#6;BODY$(14,14):POSITION 6,11:?
#6;BODY$(15,15)
1690 A=A+1:GOSUB 2160:GOTO 1290
1700 REM LEFT ARM
1710 POSITION 4,9:?
#6;BODY$(16,17):A=A+1:GOSUB
2160:GOTO 1290
1720 REM RIGHT ARM
1730 POSITION 7,9:?
#6;BODY$(18,19):A=A+1:GOSUB
2160:GOTO 1290
1740 REM LEFT LEG
1750 POSITION 5,12:?
#6;BODY$(20,20):POSITION 4,12:?
#6;BODY$(21,21):A=A+1:GOSUB
2160:GOTO 1290
1760 REM RIGHT LEG
1770 POSITION 7,12:?
#6;BODY$(22,22):POSITION 8,12:?
#6;BODY$(23,23):A=A+1
1780 POKE 709,10:POKE 752,1:? :? :?
:? "SORRY, YOU HAVE BEEN HANGED."
1790 ? "THE CORRECT WORD WAS
";ANSWER$;".":ME=ME+1:POSITION
17,5:? #6;ME:GOSUB 2590
1800 GOTO 2000
1810 REM PLACE CORRECT LETTERS
1820 ON I GOTO
1830,1840,1850,1860,1870,1880,1890,1
900,1910,1920
1830 POSITION 0,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1840 POSITION 2,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1850 POSITION 4,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1860 POSITION 6,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1870 POSITION 8,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1880 POSITION 10,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB

```

```

1940:GOTO 1580
1890 POSITION 12,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1900 POSITION 14,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1910 POSITION 16,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1920 POSITION 18,18:?
#6;WORD$(I,I):GOSUB 2110:GOSUB
1940:GOTO 1580
1930 REM
REPLACE CORRECTLY GUESSED
LETTER WITH CHECK CHARACTER
1940 WORD$(I,I)="*"
1950 IF WORD$=CHECK$ THEN POP :GOTO
1970
1960 RETURN
1970 FOR DELAY=1 TO 25:NEXT DELAY
1980 FOR I=1 TO 8:FOR V=15 TO 0 STEP
-1:SOUND 0,26,10,V:NEXT V:NEXT I
1990 ? :? :? "VERY GOOD, YOU GUESSED
THE WORD!":YOU=YOU+1:POSITION 17,4:?
#6;YOU:POKE 709,10
2000 POKE 752,0:? :? "DO YOU WANT TO
PLAY AGAIN?";:CLOSE #1:GOSUB 2670
2010 L$=CHR$(L)
2020 IF L$="Y" THEN
CHECK$="":ALPHABET$="":Z=INT(32*RND(
0)+1):RESTORE
2250+Z*10:X=INT(50*RND(0)+1):GOTO
980
2030 IF L$="N" THEN 2060
2040 ? :? :? :? :POKE 709,10
2050 GOTO 2000
2060 ? :? :? :? :? :? "DOES ANOTHER
PERSON WANT TO PLAY?";:POKE
709,10:CLOSE #1:GOSUB 2670
2070 L$=CHR$(L)
2080 IF L$="Y" THEN
ALPHABET$="":CHECK$="":GOTO 850
2090 IF L$="N" THEN GRAPHICS 0:END
2100 ? :? :? :GOTO 2060
2110 SOUND 1,60,10,15
2120 FOR K=1 TO 25:NEXT K
2130 SOUND 1,0,0,0
2140 ALPHABET$(C)=L$
2150 RETURN
2160 SOUND 1,40,12,15
2170 FOR K=1 TO 25:NEXT K
2180 SOUND 1,0,0,0
2190 ALPHABET$(C)=L$

```



2200 RETURN  
 2210 REM  
 SUBROUTINE TO CHECK INPUT LETTER IS  
 A TO Z  
 2220 OK=0  
 2230 IF L<65 OR L>90 THEN RETURN  
 2240 OK=1:RETURN  
 2250 DATA  
 HOUSE, BANANA, HAMBURGER, BOOK, BICYCLE,  
 CHICKEN, SCHOOL, NECKLACE, THUNDER, GARA  
 GE, AUTOMOBILE, TELEVISION  
 2260 DATA  
 CABBAGE, FAMILY, STEREO, JACKET, SLIPPER  
 Y, LAWNMOWER, ELEPHANT, ROBE, ELEVATOR, P  
 RINCESS, STOMACH, LIZARD, CAT  
 2270 DATA  
 SUGAR, MUSTARD, ENVELOPE, COVER, CUCUMBE  
 R, BUSH, NEWSPAPER, SLIPPERS, CATSUP, TOM  
 ATO, WRIST, SLEEVE, PICTURE  
 2280 DATA  
 LIGHTNING, STOVE, HANGMAN, TRAIN, COW, SW  
 ING, CHAIR, QUEEN, YELLOW, COUCH, AWNING,  
 FENCE, COMPUTER, MICROWAVE  
 2290 DATA  
 LOCOMOTIVE, DOUGHNUT, RECORD, MEMORY, NO  
 TEBOOK, TELEPHONE, WONDERFUL, SNAKE, CAR  
 PET, SUITCASE, WAGON, BOX, CONCRETE  
 2300 DATA  
 SPACE, GOVERNOR, HISTORY, MONKEY, BULB, T  
 URKEY, SHOULDER, SOCKS, ALARMING, CHEERF  
 UL, BUSINESS, CRAFTY, BACKGAMMON  
 2310 DATA  
 GOOSE, FEVER, CHESTNUT, HARMONY, SLIDE, C  
 ORNEA, STREET, SCREEN, CRESCENT, PARODY,  
 ASSEMBLY, BASIC, SHORTBREAD, FOX  
 2320 DATA  
 COMPANION, SEARCH, FOUL, CHARACTER, SNOU  
 T, PICKLE, CHANNEL, ICE, FOREMAN, GROUND,  
 CASTER, PITCHER, REFEREE, NYLON  
 2330 DATA  
 DEVELOP, JURY, BARTER, ONION, PEPPER, EXC  
 HANGE, COMICAL, TRY, COUNTRY, LIVER, PORC  
 H, EXCITING, POSSIBLE, SLY  
 2340 DATA  
 COURT, BASIN, CARROT, FRUIT, SHAVE, FRY, Q  
 UIET, FRIGID, COSMOS, SHELVE, INFIRMARY,  
 SHOOT, CARRIAGE, LOVELY, SHAMEFUL  
 2350 DATA  
 CHIVALRY, GLOVE, DOG, CHEMICAL, MITTEN, S  
 HINGLE, GRASS, OXEN, CRYSTAL, LEMONADE, H  
 OVER, CLARINET, GAME, CONCEIVE  
 2360 DATA  
 TIE, HAIR, OFFICIAL, CLEVER, CANOE, CARNI  
 VAL, ATMOSPHERE, GOVERNMENT, KISS, TREE,

MONEY, KILN, ROSTER, CONFLICT  
 2370 DATA  
 NOVICE, KICK, FIRE, ROCK, LOTTERY, GRAFT,  
 ELDERLY, TULIP, RANGER, HUNGRY, POLICEMA  
 N, SHOELACE, CRIMP, PUDDLE, HARSH  
 2380 DATA  
 ORANGE, COMFORT, ALLIGATOR, CHURCH, CHIM  
 NEY, HELICOPTER, BOTTLE, HARP, EGG, PANCA  
 KE, UNIFORM, SHOTGUN, CHARISMA  
 2390 DATA  
 DONKEY, FIR, SQUELCH, CRAZY, COAL, SEDAN,  
 INK, ROUGE, LEVEL  
 2400 DATA  
 EVERGREEN, CONCRETE, EXIT, CRUMB, VOLUME  
 , DRAWER, NUMBER, MANUAL, THORN, ELECTRIC  
 , SHRINK, EXPLOSION, PIANO, JAM  
 2410 DATA  
 SIDING, HARMONY, COASTER, JINGLE, PRIEST  
 , OVAL, CARTRIDGE, MINK, SIDEWALK, SPINAC  
 H, CONCAVE, LANGUAGE, UTILITY  
 2420 DATA  
 EARTH, PLANETARY, MYSTERY, SWITCH, GREML  
 IN, CASINO, MILITARY, AIRPLANE, CONVEX, W  
 HEAT, BOLOGNA, HARVEST, GLUE  
 2430 DATA  
 CRUST, ANTELOPE, ILLNESS, CABINET, CANNO  
 N, SOFTWARE, FUDGE, SHAMPOO, POTATO, GRAN  
 ITE, SILVER, CEMETARY, RIFLE  
 2440 DATA  
 SHERIFF, WATERMELON, PILLOW, PROGRAM, MI  
 SERY, MIRROR, STOPWATCH, CANDLE, APARTME  
 NT, ENCLOSURE, PANEL, OUTDOOR  
 2450 DATA  
 MODULE, HARNESS, CABLE, DETECTIVE, STAIR  
 WAY, RECORD, MERGE, TRAFFIC, HIGHWAY, SOU  
 P, FEMALE, CUSTARD, FRAME, GIZZARD  
 2460 DATA  
 KNIFE, LAXATIVE, SCHEDULE, DRAGON, CHORU  
 S, ORCHESTRA, FISH, RASPBERRY, FASHION, C  
 USHION, TOXIC, GARBAGE, MORNING  
 2470 DATA  
 DOLLAR, QUARTER, POCKET, LIGHTER, CHINES  
 E, CIGARETTE, LESSON, PISTOL, DOCTOR, CRI  
 BBAGE, MARRIAGE, DESK, FREIGHT  
 2480 DATA  
 RAILROAD, CABOOSE, FACTORY, BOXCAR, JETL  
 INER, AIRPORT, HONEY, CHESS, BRIDGE, HEAR  
 T, LUNATIC, MOON, CHURCH, VACCINE  
 2490 DATA  
 COWBOY, INDIAN, CONTINENT, STUDENT, UNIV  
 ERSITY, HOTEL, GOLD, PLATINUM, MONSTER, S  
 ALAD, MODEM, PRINTER, MANGO  
 2500 DATA  
 BOARD, HAT, GREASE, ANTLER, FOREARM, WATC

H, KNUCKLE, ROUTE, CASTER, MORMON, WALNUT  
, STATUTE, EARPHONE, RADIO, SPRING

2510 DATA

WEDDING, VAULT, KNEECAP, HAIRCUT, PERMAN  
ENT, COBBLER, TEA, COACH, DITCH, HANDCLIFF  
, RODEO, ERROR, BRICK, ALBUM, PIG

2520 DATA

GASKET, CHANNEL, BUTTON, VASE, CONSTRUCT  
, MORTGAGE, FINGER, FEDERAL, STATION, CAB  
BAGE, LETTUCE, MONEY, CORPORAL

2530 DATA

MANAGER, SERGEANT, MOOSE, LARIAT, HOMONY  
, EGGPLANT, GRAFT, CHORD, PENCIL, ERASER,  
WALLET, CORNET, MACHINE, CANISTER

2540 DATA

SKILLET, CAMPFIRE, CANVAS, QUARRY, SANDB  
OX, QUILT, HINGE, KEYRING, ELBOW, THIGH, L  
AUGHTER, NEPHEW, CANINE, BRONZE

2550 DATA

PEPPERMINT, DAUGHTER, COCKTAIL, RAZOR, D  
RAPERY, FEATHER, CRUNCH, LICORICE, PIZZA  
, BLACKBOARD, BLACKBERRY, PRIVATE

2560 DATA

LUXURIOUS, HAIRSPRAY, BARBER, LIBRARY, S  
EPTEMBER, BIRTHDAY, FORMAT, MONGOOSE, WR  
ANGLER, SENATOR, DESSERT, CRATE

2570 DATA

CHEESECAKE, GRAPEVINE, HOSTAGE, MOUNTAI  
N, VALLEY, VALET, QUICKSAND, LEATHER, FRO  
STING, UNDERWEAR, PAJAMAS, FERN

2580 DATA 1E97

2590 RESTORE 2720

2600 READ PITCH, DURATION, REST

2610 POKE 540, DURATION

2620 IF PITCH=-1 THEN RETURN

2630 SOUND 0, PITCH, 10, 8

2640 IF PEEK(540)=0 THEN SOUND

0, 0, 0, 0: GOTO 2660

2650 GOTO 2630

2660 POKE 540, REST: GOTO 2600

2670 POKE 764, 255

2680 OPEN #1, 4, 0, "K: "

2690 GET #1, L

2700 POKE 709, 1

2710 RETURN

2720 DATA

204, 36, 9, 204, 36, 9, 217, 12, 9, 204, 36, 9,

173, 36, 9, 182, 12, 9, 182, 36, 9, 204, 12, 9,

204, 36, 9, 217, 12, 9, 204, 42, 9, -1

2730 DATA 0, 0

## ABOUT THE COVER

The screen dump from this month's featured program was printed on a Gemini-10 printer using Printwiz by Jerry Allen of Allen Macroware. Printwiz supports Epson, NEC, Prowriter, Okidata and Gemini printers. It is a machine language utility that can be loaded with BASIC, Logo, or the Assembler Cartridge in place, and will run with any program that does not attempt to use the Printwiz dump memory area. Printing is done in a horizontal format to allow mixing graphics with text. Pictures may easily be printed in inverse, centered horizontally, and printed in single or double height and various widths and densities, depending on the printer used. You can call the routine from the keyboard while another program is running, as was done to print the Journal cover, or call the printing routine from BASIC or machine language. The disk also offers a printing demo, a program that prints out a command summary sheet, a program to show the current configuration of commands to be sent to the printer, a custom label-printing utility, a graphics loader, three custom fonts, a utility to load Paint files, and a file to allow use of Printwiz with Logo procedures. An added attraction is a Lister program which does not need the Printwiz routine and will list out your BASIC programs, including inverse video and graphics characters in three different formats. The documentation is clear and includes tips for getting the best results out of the program. Printwiz is probably available at your favorite local computer dealer.

## GIVE UP?

The word which is partially shown in the game of Hangman on the front cover is "LUXURIOUS".

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## SCREEN PRINT UTILITY

by Russell Crum

A pet peeve of mine is a program that leaves the user guessing as to what it does and how to use it. I have made it a practice on my own programs and those that I have copied from magazines to add instructions to the user when the program is run. The primary "pain in the fingers" in doing this is getting the text to come out correctly without splitting words or leaving awkward spaces.

I found a simple utility in a computer magazine a couple of years ago that solves this problem nicely. I modified it for the Atari and use it anytime that I have more than a couple of lines of instructional text to put on the screen. This is a very elementary word processing subroutine, but serves the purpose well. Following is the routine which can be located wherever needed in the program:

```
10 A$=" (your text to be printed on the screen)
20 FOR I=37 TO LEN(A$) STEP 37:FOR J=0 TO
37
30 IF A$(I-J,I-J)=CHR$(32) THEN POP: GOTO
50
40 NEXT J
50 ? A$(I-36,I-J): I=I-J: IF (I+37)>LEN(A$)
THEN POP: GOTO 70
60 NEXT I
70 ? A$(I+1): ? : ? "PRESS 'START' TO
CONTINUE": POKE 53279,8
80 IF PEEK(53279)<>6 THEN GOTO 80
```

Here is an explanation of the program for those who don't think it is obvious. After the text to be printed is entered into the string, line 20 starts the computer at the 37th character in the string. The 37th character is used instead of the 38th to avoid any automatic linefeeds. The "J" loop causes the computer to step backward from the 37th character until a space (code 32) is found. At this point line 50 causes the string from the first character through the space just found to be printed. The outer loop counter value is then changed to the character position just printed. Next a check is made to be sure that the next "I" loop step increment will not

exceed the length of the string. If the length would be exceeded, the balance of the string is printed (line 70). If the length would not be exceeded, the process is repeated (line 60). This utility would not cope with a substring series that exceeds 37 characters. If you have that situation, you should probably examine your text for proper construction anyway. If you do have some long words that cause awkward appearing text, minor modification with a hyphen followed by a space should solve the problem.

The last part of line 70 and line 80 read the CONSOLE switch port so that users can take the time they need to read the text. This particular syntax checks for the START key being pressed to proceed with the program. Another console key could be used by changing to the appropriate value in line 80.

This utility is simple, but very effective. It makes extensive user instructions much more legible and rather painless to enter. Now, if we could just do something about the grammar...

## NEW ATARI SERVICE POLICY

Those of you who have had the misfortune of equipment problems lately may have heard various versions of the new Atari service policy. Here is the official version, courtesy of Dave Heinrich, manager of the Family Computer Center in Berkley (an Authorized Atari Service Center):

For new merchandise, there will be over-the-counter exchanges for 90 days from the date of purchase. After 90 days, equipment will be repaired. This means that you will have to return your purchases where you bought them for exchange within the warranty period. If the merchant still has that particular piece of equipment in stock, you should be able to get an immediate replacement. After the warranty has expired, you can have your equipment repaired wherever you choose.

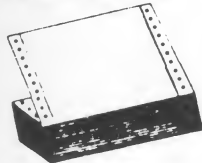


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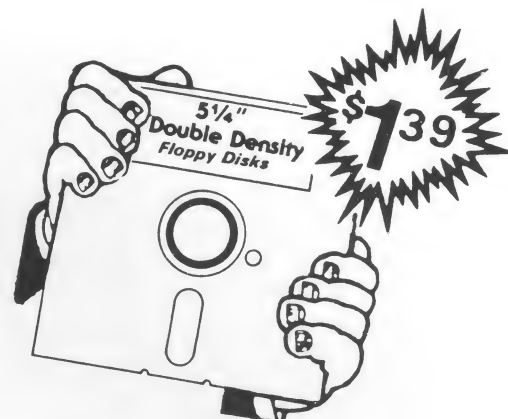
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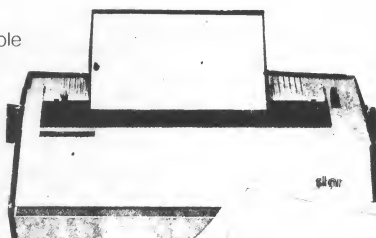
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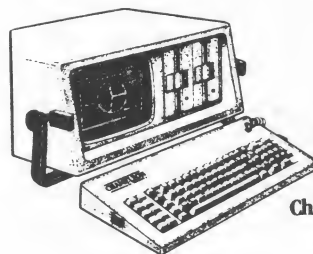
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## LIBRARY SUBMISSIONS

MACE has a great program library - perhaps the best around. We can keep it great only with your help. To inspire you and encourage you to keep those submissions coming in, we are making the following offer: the person submitting the best program (on disk or cassette) each month will receive a free disk or tape from the library. Winners will be announced in the Journal. Just think - fame, glory, and a free disk or cassette! What more could you ask?

## JOURNAL SUBMISSIONS

We need your material to help make the MACE Journal a success. Original programs, articles, reviews, editorials, letters to the editor, screen dumps for covers - anything that you think others might find useful or entertaining will be most welcome. If we publish something of yours, we will give you a certificate for a free disk or cassette from the MACE library. Every three months, we will pick the best submission(s) to receive a special prize.

Please send articles, reviews, programs, etc. on disk or cassette as well as in written form. You may use AtariWriter, Letter Perfect, or any other compatible word processor (let's face it - if a long article has to be re-typed, it will have to be VERY good to be included). Programs should be LISTed to disk or cassette if possible. For screen dumps, please enclose a printed copy with the file and indicate the picture format (Micropainter, AtariArtist, Koalapad, etc.) You can arrange to pick up your disk or cassette at the MACE meeting following publication, or enclose a self-addressed, stamped mailer for its return. Be sure to include your name, address and telephone number on all materials so that we can contact you if we have any questions.

## COMING ATTRACTIONS

Next month we will be starting a series of articles about customizing an AMIS-based BBS program (the program itself will be available from the disk library). This should give all you modem jockeys a chance to ride the wires in style.

Look for an article especially for cassette users, an explanation of our listing conventions (once we decide what they are going to be), and more about Atari Logo. Remember to send in YOUR submissions.

Scott Garland, our Program Coordinator, already has the following planned for the November meeting:

- Lightpen demo
- Astronomy software demos
- More information about our SIGs

Monthly meetings throughout the rest of 1984 will be on the third Tuesday of the month:

- November 20th
- December 18th (the Christmas party)

## THE MESSAGE BASE

If your message were here, you and hundreds of other Atari enthusiasts could be reading it right now. Got a problem? A solution? Looking for a fellow Archon addict? Want to unload some hardware? Want to buy something computerish? This is your chance. Now even those of you without modems can experience the thrill of reading other people's E-mail. Or maybe we should call this J(ournal)-mail. Whatever...

So send in your goodies, and if it won't get us arrested, we'll print it. Fair enough?



## CASSETTE CORNER

by Mike Landis

At the last meeting I said that the cassette library needed work and that's what I've given it! When you stop by the cassette library you will notice several new items. We are going to provide monthly specials for current members. These specials will be packaged in a group of three. This month's special contains:

Tape R: This tape is filled with utility programs. Check register program, amortize loan payments, expense report files, book data base, IRA planner and a word processor.

Tape V: This tape is packed with adventure type games. These are challenging text games; they sure beat the shoot'em up games! Quest, Dog Bite, 5th Dimension, Detective and The Electric Co.

Tape K: This is the educational tape which you have been waiting for! These will teach and refresh both young and old alike. Typing, Light, Learn Stars, Math, First Aid and Multiplication.

Not only are you getting outstanding programs; you are also getting an outstanding price. These tapes are normally sold for a meager \$4.00 each. That's not much more than a blank cassette! But, because these are this month's specials, MACE members will be able to purchase these three tapes for ONLY \$10.00, that's two bucks off regular prices!!

That's not all, folks! We have added several new tapes that are even more exciting. But, we have a small problem: we want to add more new tapes but we have run out of room. So what we have decided to do is reduce our current inventory to make room for the new ones. This means more fantastic savings for MACE members. We are going to make this offer for a limited time only! You can purchase 6 tapes for \$20.00 dollars. You are getting 6 tapes for the price of 5. Wow, what a deal!

That's STILL not all, folks! Do you have a utility, educational or game program that you wrote and are keeping to yourself? If you do and would like to share it with us, bring a copy of it to the next meeting and submit it to me for consideration. Not only do you get fame and glory, you are helping out fellow members.

Well, I guess that's about it for now. I would like you to take the time to stop by the cassette table and offer suggestions on how I can serve the members better. Of course, I will be available to answer questions about our tapes or to help you pick out the best software for your needs. Remember, with each other's support we can make this the best users group in the galaxy!

## GREETINGS FROM YOUR EDITOR...

Those of you who read your MACE Journal with the lights on will have noticed that our format has changed. For financial reasons, we have had to cut back on the quality of paper we use - we certainly do not intend to cut back on the quality within the journal. We hope to be able to bring you useful and interesting information in each issue. In order to do this, we will need suggestions and submissions from the membership (that's you). If you don't tell us what you'd like to read, we will fill it up with whatever interests us, and you will just have to put up with it.

So...rev up your disk drives, plug in those Atariwriter cartridges (or grab a crayon and a brown paper bag), and let us hear from you. Put the last finishing touches on that wonderful little utility you've been meaning to finish for the past six months. Pry your wacky fingers away from your Wico and tell everyone else about that mesmerizing new game you bought. Let loose your artistic talents with AtariArtist or Micropainter (or whatever) and send in your favorite screen dump. Remember - you can read what we want you to read, or you can read what you want to read. It's up to you.

## TYPERS

by Ann McBain Ezzell

TYPERS is a short program that will let you practice your touch typing. It uses a vertical blank interrupt routine to flash one of the characters printed on a keyboard mockup at the top of the screen. You must type the flashing character. For every correct keypress, one of the stars at the bottom of the screen will change color. An incorrect keypress will change a star back to its original color. After you have changed the color of all of the stars, you will be told how long it took you to complete the exercise. Pressing any key will let you play again.

The vertical blank routine is stored on page 6 in the second loop on line 140. This routine will change the color of anything drawn or printed with color register 2 (location 710). Here is the source code for the routine, for those of you interested in machine language:

```
10 ;VBI ROUTINE TO FLASH
    COLOR REGISTER 2 (710)
20 *=$0600
30 XITVBV=58466
40 ITER=203
50 COLOR2=710
60 DEC ITER
70 BNE BACK
80 INC COLOR2
90 INC COLOR2
0100 LDA #10
0110 STA ITER
0120 BACK JMP XITVBV
```

The source code sets up labels for XITVBV, the entry point for exiting from a vertical blank routine, ITER, which is simply used as a scratchpad location, and COLOR2, the color register to be changed. You could flash a different register by replacing 710 with the address of the register you want to flash. The routine itself is simple; first it decrements the contents of ITER, compares the new value with zero, and returns if the new value is not equal to zero. If the value is zero, the value in COLOR2 is incremented twice (because color

values are always even), then ITER is reset to 10. Once the routine starts, the color in register 2 will be changed every tenth vertical blank interrupt, or 6 times a second. The speed of flashing can be controlled by changing the value stored in ITER.

Line 160 resets the VBI vector. To avoid sending your Atari off into Never-Neverland, you must disable the interrupts while you change the vector. POKEing 54286 with 0 does just that. Locations 548 and 549 hold the address of the VBI routine. POKEing 54286 with 64 restores the VBIs to their power-up enabled state.

The rest of the program is mostly for handling the screen display, sound effects, and time-keeping. The GOSUB at line 260 disables the BREAK key. The GOSUB at line 270 ensures that all keypresses will be interpreted as uppercase, non-inverse video characters. Line 320 sets the timer registers to zero, then line 500 calculates the elapsed time in seconds.

I hope you enjoy playing with TYPERS, and take the time to fiddle with the VBI routine to adjust it for your own uses.

## IS YOUR TIME ABOUT UP?

Please take a moment to look at the mailing label on the back cover of this Journal. Are your name and address correct? And what about that date in the upper right-hand corner? That's the expiration date of your MACE membership. If it's coming up soon, plan to renew at the next MACE meeting, or fill out the membership form on the inside back cover and mail it to:

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Don't let your MACE membership expire! MACE may be the most important peripheral you'll ever own.

```

100 REM typer.bas by A.M. Ezzell
110 REM October 1984 MACE Journal
120 DIM CO(3),KEY$(46)
130 KEY$="1234567890<>QWERTYUIOP==A
SDFGHJKL;+*ZXCVBNM,./"
140 FOR I=0 TO 3:READ C:CO(I)=C:NEXT
I:FOR I=1 TO 17:READ C:POKE
1535+I,C:NEXT I
150 XC=6:YC=7:OOPS=210:BK=260:
UPCASE=270:A=46:B=1
160 POKE 54286,0:POKE 548,0:POKE
549,6:POKE 54286,64:REM reset VBI
vector
170 GOTO 300
180 DATA 32,64,160,192
190 DATA 198,203,208,10,238,198,2,
238,198,2,169,1,133,203,76,98,228
200 REM gosubs
210 SOUND 0,200,10,8:FOR I=1 TO
50:NEXT I:SOUND 0,0,0,0
220 IF (XC=6 AND YC=7) THEN RETURN
230 COLOR 42:PLOT XC,YC
240 XC=XC-1:IF XC<7 THEN
XC=6+5*(YC<>7):YC=YC-(YC<>7)
250 RETURN
260 IF PEEK(16)<128 THEN RETURN
265 POKE 16,PEEK(16)-128:POKE
53774,PEEK(16):RETURN
270 IF X=155 THEN 280
275 X=X-128*(X>127):
X=X-32*(PEEK(702)=0 AND X>96)
280 POKE 702,64:POKE 694,0:RETURN
300 GRAPHICS 18:POKE 708,132:POKE
712,128:POKE 709,198:GOSUB BK:OPEN
#2,4,0,"K:"
305 FOR I=6 TO 13:COLOR 3:PLOT
I,6:PLOT I,11:NEXT I:FOR I=7 TO
10:COLOR 3:PLOT 6,I:PLOT 13,I:NEXT I
307 FOR I=7 TO 12:FOR J=7 TO
10:COLOR 42:PLOT I,J:NEXT J:NEXT I
310 POSITION 4,1:? #6;KEY$(1,12):
POSITION 4,2:? #6;KEY$(13,24):
POSITION 4,3:? #6;KEY$(25,36)
315 POSITION 4,4:? #6;KEY$(37)
320 POKE 18,0:POKE 19,0:POKE 20,0
330 KEY=INT(RND(0)*A)+B:
L=ASC(KEY$(KEY)):XKEY=KEY+3-12*INT((
KEY-1)/12):YKEY=1+INT((KEY-1)/12)
350 COLOR L+128:PLOT XKEY,YKEY
360 GET #2,X:GOSUB UPCASE
365 IF (X<42 OR X=63 OR X=64 OR
X>90) THEN 360
370 IF X<>L THEN GOSUB OOPS:GOTO 360
380 FOR I=10 TO 150 STEP 10:SOUND

```

```

0,1,10,8:NEXT I:SOUND 0,0,0,0
400 XC=XC+1:IF XC>12 THEN
YC=YC+1:XC=7
410 COLOR 138:PLOT XC,YC:COLOR
L:PLOT XKEY,YKEY:IF (XC=12 AND
YC=10) THEN 500
420 GOTO 330
500 TIME=INT((PEEK(18)*65536+
PEEK(19)*256+PEEK(20))/60)
510 GRAPHICS 18:POKE 712,128:POKE
709,198:POKE 708,70:GOSUB BK
520 POSITION 2,2:? #6;"CONGRATULA
TIONS":REM inverse video
530 FOR I=1 TO 10:FOR J=5 TO 150
STEP 10:SOUND 0,J,10,8:NEXT J:NEXT
I:SOUND 0,0,0,0
540 POSITION 3,5:? #6;"YOU DID IT
IN":POSITION 4,6:? #6;TIME;"
SECONDS"
550 POSITION 3,8:? #6;"press any
key":POSITION 3,9:? #6;"to play
again"
560 GET #2,X:CLOSE #2:RUN

```

## SOLVING QUADRATIC EQUATIONS

by Carl Stebner

(This article first appeared in the November 1983 MACE Journal, which many of you may not have received due to mailing difficulties. - Ed.)

Algebra students, whether in high school or college, are eventually faced with the problem of solving quadratic equations. Quadratic equations are also called second degree equations. They are characterized by having the independent variable raised to the second power and can be written in the form:

$$aX^2 + bX + c = 0$$

The terms a, b and c do not include X. A cannot equal 0, or the equation is not quadratic.



To solve the equation means to find the value of X. In a quadratic equation, there are two "roots" or solutions. Two ways to find the roots are factoring and completing the square. However, a universal solution is given by the quadratic formula:

$$X = (-b \pm \sqrt{b^2 - 4ac}) / 2a$$

The following is a short program to evaluate the roots of any quadratic equation, using the quadratic formula. In line 20, the terms a, b and c are requested and must be inserted in order. If no b or c term is in the formula, then input 0.

Lines 30-35 calculate the value under the square root sign (the discriminant) so that the computer can give a numerical answer. The value 0.5 is added to eliminate the computer's rounding errors. Depending on the value of D, the roots have different forms. Lines 40-60 check this. Lines 70-80 calculate the roots if D is non-negative, then the answer is printed.

If the term under the root is negative, the term cannot be calculated on the computer nor further reduced mathematically.

Basically, the square root of -1 is undefined. That is, there are no two equal numbers which, when multiplied together, give -1. Therefore, the square root of -1 is usually given an alpha designation, I in this program. Numbers which contain the square root of a negative number are called imaginary.

Lines 200-245 calculate the roots when the discriminant is negative. Line 200 recalculates D using the variable E with the terms rearranged so the result is positive, realizing that -1 can be factored out and its square root defined as I. Line 200 could be written like line 30, then an extra line, 201 E=ABS(E), added with the same result.

Also the roots may be rewritten, as is done in lines 210 and 220, to separate out the imaginary part of the root. Many quadratic roots do not fit easily into the standard form. In those cases, algebraic and arithmetic manipulations are necessary to obtain a single numerical value for a, b and c. That is, to input 3\*(2+SQR(3)) will not be accepted by the

computer. Also, to avoid errors when evaluating a, b or c when they contain a square (or other) root, the number needs to be extended far enough to the right of the decimal point. Otherwise peculiar results will be obtained.

```

5 DIM G$(10)
10 PRINT "THIS PROGRAM CALCULATES
THE ROOTS OF A QUADRATIC
EQUATION, A*X^2+B*X+C=0"
20 PRINT "INPUT TERM:";PRINT "A="
";:INPUT A:PRINT "B=" ";:INPUT
B:PRINT "C=" ";:INPUT C
25 PRINT
:D=E^2-4*A*C:D=INT(D+0.5)
40 IF D<0 THEN PRINT "ROOTS
IMAGINARY AND UNEQUAL":GOTO 200
50 IF D=0 THEN PRINT "ROOTS REAL
AND EQUAL"
60 IF D>0 THEN PRINT "ROOTS REAL
AND UNEQUAL"
70 R1=(-E+SQR(D))/(2*A)
80 R2=(-E-SQR(D))/(2*A)
90 PRINT "FIRST ROOT IS
";R1:PRINT
100 PRINT "SECOND ROOT IS
";R2:PRINT
110 GOTO 250
120 END
200 E=4*A*C-B^2
205 E=INT(E+0.5)
210 X1=-E/(2*A)
220 X2=SQR(E)/(2*A)
225 PRINT :PRINT "FIRST ROOT IS
";X1;" + ";X2;" * I"
235 PRINT :PRINT "SECOND ROOT IS
";X1;" - ";X2;" * I"
245 PRINT :PRINT "WHERE I =
SQUARE ROOT OF -1"
250 PRINT "ANOTHER PROBLEM? YES
OR NO";
255 INPUT G$
260 IF G$="YES" THEN GOTO 20

```

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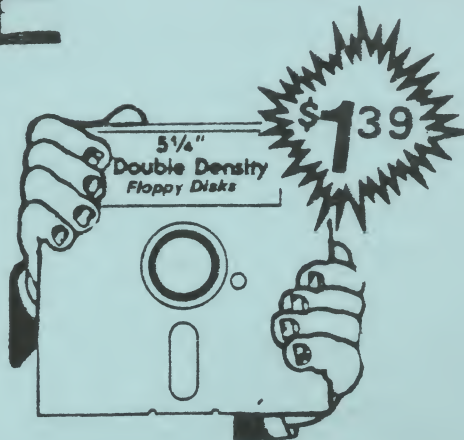
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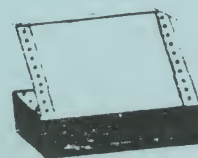
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